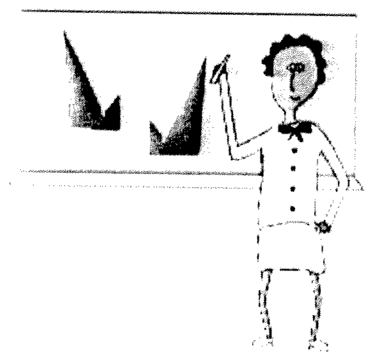
Transformation Rules Sheet



Line Reflections:

$r_{x\text{-}axis}(x, y) = (x, -y)$

$r_{y\text{-}axis}(x, y) = (-x, y)$

$r_{y=x}(x, y) = (y, x)$

$r_{y=-x}(x, y) = (-y, -x)$

Point Reflection:

$R_{180^\circ}(x, y) = (-x, -y)$

Rotations:

$R_{90^\circ}(x, y) = (-y, x)$

$R_{180^\circ}(x, y) = (-x, -y)$

$R_{270^\circ}(x, y) = (y, -x)$

$R_{-90^\circ}(x, y) = (y, -x)$

Translation:

$T_{a,b}(x, y) = (x + a, y + b)$

Dilation:

$D_k(x, y) = (kx, ky)$

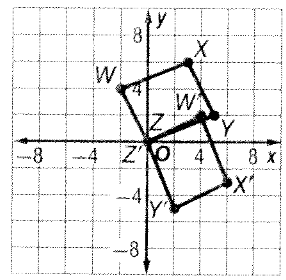
9-3 Study Guide and Intervention *(continued)*

Rotations

Draw Rotations In The Coordinate Plane The following rules can be used to rotate a point 90°, 180°, or 270° counterclockwise about the origin in the coordinate plane.

To rotate	Procedure
90°	Multiply the *y*-coordinate by −1 and then interchange the *x*- and *y*-coordinates.
180°	Multiply the *x*- and *y*-coordinates by −1.
270°	Multiply the *x*-coordinate by −1 and then interchange the *x*-and *y*-coordinates.

Example **Parallelogram $WXYZ$ has vertices $W(-2, 4)$, $X(3, 6)$, $Y(5, 2)$, and $Z(0, 0)$. Graph parallelogram $WXYZ$ and its image after a rotation of 270° about the origin.**



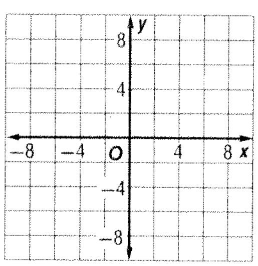
Multiply the x-coordinate by −1 and then interchange the x- and y-coordinates.

$(x, y) \rightarrow (y, -x)$
$W(-2, 4) \rightarrow W'(4, 2)$
$X(3, 6) \rightarrow X'(6, -3)$
$Y(5, 2) \rightarrow Y'(2, -5)$
$Z(0, 0) \rightarrow Z'(0, 0)$

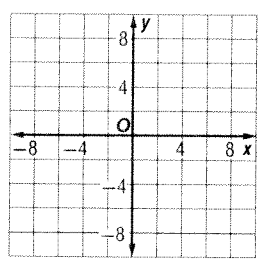
Exercises

Graph each figure and its image after the specified rotation about the origin.

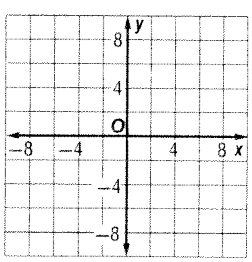
1. trapezoid $FGHI$ has vertices $F(7, 7)$, $G(9, 2)$, $H(3, 2)$, and $I(5, 7)$; 90°



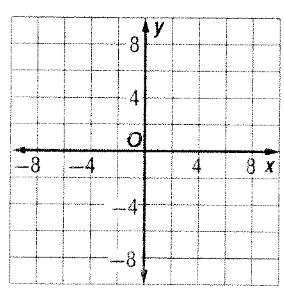
2. $\triangle LMN$ has vertices $L(-1, -1)$, $M(0, -4)$, and $N(-6, -2)$; 90°



3. $\triangle ABC$ has vertices $A(-3, 5)$, $B(0, 2)$, and $C(-5, 1)$; 180°



4. parallelogram $PQRS$ has vertices $P(4, 7)$, $Q(6, 6)$, $R(3, -2)$, and $S(1, -1)$; 270°



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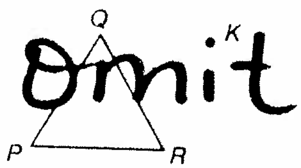
9-3 Skills Practice

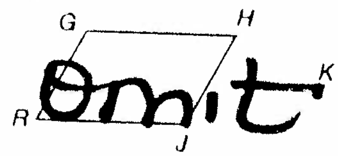
Rotations

Use a protractor and ruler to draw the specified rotation of each figure about point K.

1. 30°

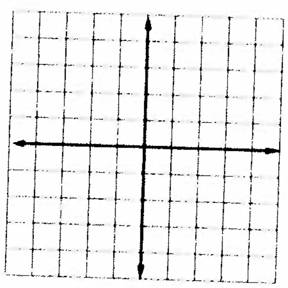


2. 150°

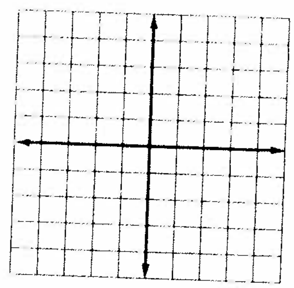


Graph each figure and its image after the specified rotation about the origin.

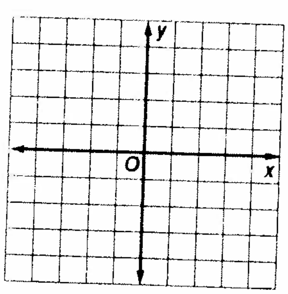
3. $\triangle STU$ has vertices $S(2, -1)$, $T(5, 1)$ and $U(3, 3)$; 90°



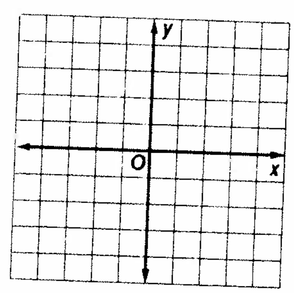
4. $\triangle DEF$ has vertices $D(-4, 3)$, $E(1, 2)$, and $F(-3, -3)$; 180°



5. quadrilateral $WXYZ$ has vertices $W(-1, 8)$, $X(0, 4)$, $Y(-2, 1)$ and $Z(-4, 3)$; 180°



6. trapezoid $ABCD$ has vertices $A(9, 0)$, $B(6, -7)$, $C(3, -7)$ and $D(0, 0)$; 270°



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9-6 Study Guide and Intervention *(continued)*

Dilations

Dilations In The Coordinate Plane To find the coordinates of an image after a dilation centered at the origin, multiply the x- and y-coordinates of each point on the preimage by the scale factor of the dilation, r.

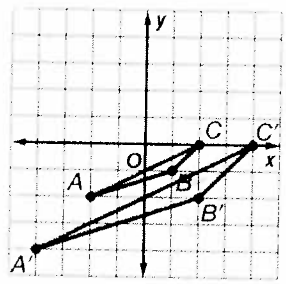
$$(x, y) \rightarrow (rx, ry)$$

Example **$\triangle ABC$ has vertices $A(-2, -2)$, $B(1, -1)$, and $C(2, 0)$. Find the image of $\triangle ABC$ after a dilation centered at the origin with a scale factor of 2.**

Multiply the x- and y-coordinates of each vertex by the scale factor, 2.

(x, y)	$(2x, 2y)$
$A(-2, -2)$,	$A'(-4, -4)$
$B(1, -1)$	$B'(2, -2)$
$C(2, 0)$	$C'(4, 0)$

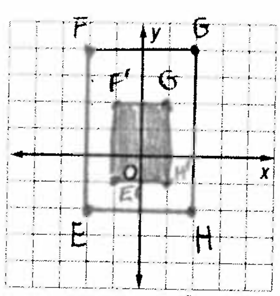
Graph $\triangle ABC$ and its image $\triangle A'B'C'$



Exercises

Graph the image of each polygon with the given vertices after a dilation centered at the origin with the given scale factor.

1. $E(-2, -2)$, $F(-2, 4)$, $G(2, 4)$, $H(2, -2)$; $r = 0.5$

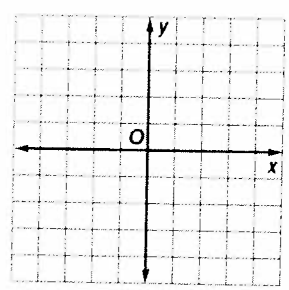


Reduction

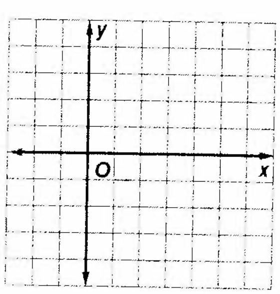
$(x,y)\rightarrow(.5x,.5y)$

E' (-1,-1)
F' (-1,2)
G' (1,2)
H' (1,-1)

3. $A(-2, -2)$, $B(-1, 2)$, $C(2, 1)$; $r = 2$



2. $A(0, 0)$, $B(3, 3)$, $C(6, 3)$, $D(6, -3)$, $E(3, -3)$; $r = \frac{1}{3}$



4. $A(2, 2)$, $B(3, 4)$, $C(5, 2)$; $r = 2.5$